(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 1 162 674 A3

(12) **EUROPEAN PATENT APPLICATION**

(88) Date of publication A3:
26.06.2002 Bulletin 2002/26

(43) Date of publication A2:
12.12.2001 Bulletin 2001/50

(21) Application number: **01202011.1**

(22) Date of filing: **28.05.2001**

(51) Int Cl.7: **H01L 51/20**, C09K 11/06, H05B 33/00, H05B 33/02, H05B 33/14

(84) Designated Contracting States:
AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU MC NL PT SE TR
Designated Extension States:
AL LT LV MK RO SI

(30) Priority: **08.06.2000 US 589731**

(71) Applicant: **EASTMAN KODAK COMPANY**
Rochester, New York 14650 (US)

(72) Inventors:
- **Hatwar, Tukaram K.,**
  c/o Eastman Kodak Company
  Rochester, New York 14650-2201 (US)
- **Rajeswaran, Gopalan,**
  c/o Eastman Kodak Company
  Rochester, New York 14650-2201 (US)
- **Tang, Ching W., c/o Eastman Kodak Company**
  Rochester, New York 14650-2201 (US)
- **Shi, Jianmin, c/o Eastman Kodak Company**
  Rochester, New York 14650-2201 (US)

(74) Representative: **Parent, Yves et al**
KODAK INDUSTRIE,
Département Brevets,
CRT - Zone Industrielle
71102 Chalon-sur-Saône Cedex (FR)

(54) **Organic electroluminescent devices with improved stability and efficiency**

(57) An organic luminescent layer for use in an electroluminescent device with improved operating life includes an organic host material capable of sustaining both hole and electron injection and recombination. The layer also includes at least two dopants: a first dopant capable of accepting energy of electron-hole combinations in the host material; and a second dopant capable of trapping the holes from the host material. The first dopant being selected so that the band gap energy of the first dopant is less than the bandgap energy of the host material and the second dopant being selected to have a hole trapping energy level above the valance band of the host material.

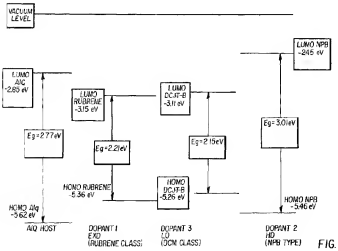

FIG. 3

EP 1 162 674 A3

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 01 20 2011

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
X	WO 99 53724 A (UNIV PRINCETON ;UNIV SOUTHERN CALIFORNIA (US)) 21 October 1999 (1999-10-21) * page 39, line 15-18 * * page 40, line 11-17 * ---	1,2,4-7, 9	H01L51/20 C09K11/06 H05B33/00 H05B33/02 H05B33/14
Y,D	Y. HAMADA ET AL.: "Red organic light-emitting diodes using an emitting assist dopant" APPLIED PHYS. LETT., vol. 75, no. 12, 20 September 1999 (1999-09-20), pages 1682-1684, XP002196211 * column 2 - column 3; figure 1 *	3	
A	---	1,2,4-10	
Y	FATEMI D J ET AL: "HIGHLY FLUORESCENT MOLECULAR ORGANIC COMPOSITES FOR LIGHT-EMITTING DIODES" SYNTHETIC METALS, ELSEVIER SEQUOIA, LAUSANNE, CH, vol. 85, 1997, pages 1225-1228, XP002911728 ISSN: 0379-6779 * column 6 *	3	TECHNICAL FIELDS SEARCHED (Int.Cl.7) H05B
A	---	1,2,4-10	
A	HAMADA Y ET AL: "INFLUENCE OF THE EMISSION SITE ON THE RUNNING DURABILITY OF ORGANIC ELECTROLUMINESCENT DEVICES" JAPANESE JOURNAL OF APPLIED PHYSICS, PUBLICATION OFFICE JAPANESE JOURNAL OF APPLIED PHYSICS. TOKYO, JP, vol. 34, no. PART 2, 1 July 1995 (1995-07-01), pages 824-826, XP002061754 ISSN: 0021-4922 * the whole document * ---	1-6,9	

-/--

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
MUNICH	24 April 2002	Doslik, N

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P04C01)

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 01 20 2011

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
A	US 5 601 903 A (FUJII TAKANORI ET AL) 11 February 1997 (1997-02-11) * examples 1-3 *	1-10	

TECHNICAL FIELDS SEARCHED (Int.Cl.7)

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
MUNICH	24 April 2002	Doslik, N

CATEGORY OF CITED DOCUMENTS

X particularly relevant if taken alone
Y particularly relevant if combined with another document of the same category
A technological background
O non-written disclosure
P intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 01 20 2011

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on. The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

24-04-2002

Patent document cited in search report		Publication date		Patent family member(s)	Publication date
WO 9953724	A	21-10-1999	US	6287712 B1	11-09-2001
			US	6210814 B1	03-04-2001
			US	6312836 B1	06-11-2001
			AU	3486199 A	01-11-1999
			WO	9953724 A1	21-10-1999
US 5601903	A	11-02-1997	JP	7065958 A	10-03-1995